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A. V. RaghuKerala Forest Research Institute
(KFRI), Peechi - 680 653, Thrissur,
Kerala, India.**Satheesh George**Department of Botany, CMS College,
Kottayam- 686001, Kerala,
India.**Renju Krishna V**Department of Botany, Mercy College,
Palakkad- 678006, Kerala,
India.**Sindhu K. K**Department of Botany, Mercy College,
Palakkad- 678006, Kerala,
India.**Correspondence:****A. V. Raghu**Kerala Forest Research Institute
(KFRI), Peechi - 680 653, Thrissur,
Kerala, India

E-Mail: dravraghu@gmail.com

Fax: +91-4872690339

Bioactive properties of phenolics present in *Oroxylum indicum* – A review

A. V. Raghu, Satheesh George, Renju Krishna V and Sindhu K. K

ABSTRACT

Oroxylum indicum, an endangered tree has great importance for its attributed medicinal properties. It is widely used in ayurveda and other traditional systems of medicine and has been extensively investigated. The many bioactivities of this species, including anticancer, antiviral, anti-inflammatory, and antibacterial properties, have been extensively studied. The main phenolic compounds like baicalein, oroxylin A and chrysin present in this species have shown therapeutic potential in some areas such as anticancer, anti-inflammatory antiviral etc. This paper reviews research on the bioactivities and bioactive phenolic compounds of *Oroxylum indicum*.

Keywords: *Oroxylum indicum*, Baicalein, Oroxylin A, Chrysin.

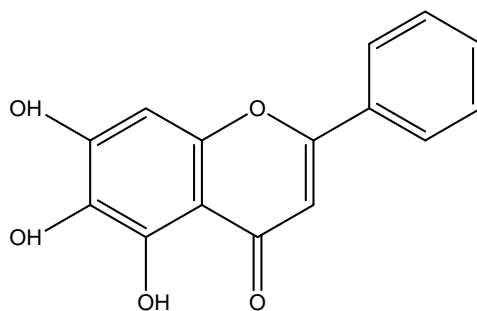
1. Introduction

Oroxylum indicum (L.) Vent. Belonging to the family Bignoniaceae is a medium sized tree, distributed throughout India in moist deciduous to evergreen forests up to an altitude of 1200 m. This species possesses economic as well as medicinal importance [1]. It has been used in Ayurveda and other traditional health systems since centuries back [2]. It is a member of the well-known 'dasamula' group, an ingredient of several important Ayurvedic formulations used to treat various ailments. Every part of this tree possesses medicinal value. The root is astringent, bitter tonic, stomachic, anodyne, anti-inflammatory and expectorant it stimulates digestion, cures fever, cough and other respiratory disorders and is useful in diarrhoea, dysentery, abdominal pain, thirst, vomiting, anorexia, rheumatism, worms, leprosy and other skin diseases, oedema and urogenital disorders [3]. The leaves are useful in stomachalgia, flatulence, ulcers and splenomegaly. The tender fruit is also reported to cure morbid *vata* and *kapha*, improve digestion, promote taste and destroy piles and worms. The mature fruits are useful in pharyngodynia, cardiac disorders, helminthiasis, gastropathy, bronchitis and haemorrhoids [2]. This species is reported to have a variety of medicinal properties like anticancer [4, 5], antiulcer [6], antidiysenteric [7], antimicrobial and anti-inflammatory activity [8]. Due to its great demand in the industry, the plant is harvested unscientifically from the wild and it leads this species to threat category. The plant is reported to be endangered for Kerala, vulnerable for Karnataka and data deficient for Tamil Nadu states of India [9, 10].

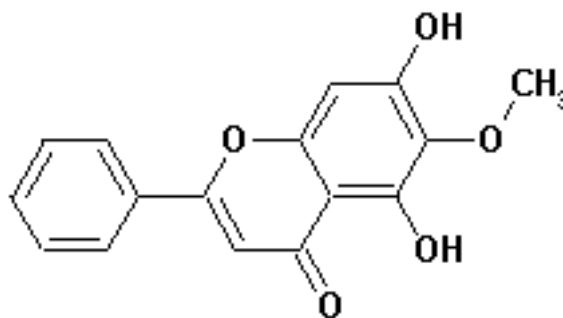
Phytocompounds present in this species attribute to its medicinal properties. Major medicinally important phenolic compounds present in this species are baicalein, oroxylin A, chrysin and its derivatives [1, 11, 12, 13, 14]. These compounds are also present in species like *Scutellaria* Spp (baicalein, oroxylin A, chrysin), *Erigeron breviscapus* (baicalein), *Gnaphalium affine* (baicalein), *Vitex peduncularis* (oroxylin A, chrysin), *Cyclanthera pedata* (chrysin), *Populus davidiana* (chrysin), *Bauhinia purpurea* (chrysin), *Teloxys graveolens* (chrysin), *Salvia officinalis* (chrysin), *Sonoran propolis* (chrysin), etc. Studies on biological activities of phytochemicals present in *O. indicum* are limited. Hence activities of these phenolic compounds reported from other species were also taken into consideration in this review so as to bring into light the importance of *O. indicum* and the compounds present in it (Table 1).

Table 1: Major phenolic compounds present in *Oroxylum indicum* and their biological properties

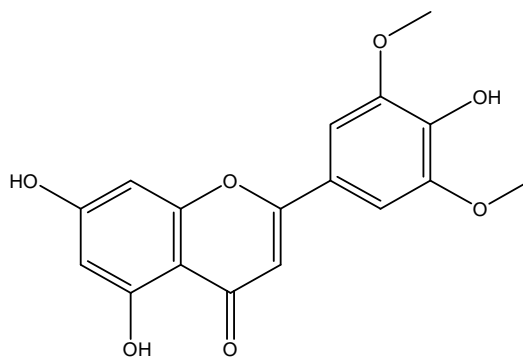
S. No.	Details of the compounds	
1	Name of the compound	Baicalein (5,6,7-trihydroxyflavone) (Fig. 1)
	Derivatives present if any	Baicalein 6-glucuronide, Baicalein 7-glucuronide, Baicalein 7-O- β -gentiobioside, Tetulin (6-glucoside of Baicalein), 8,8''-bisbaicalein 1, baicalein-7-O-caffeate 2
	Source	Stem bark and Root bark ^[6,12,14,15,16] ; Leaves ^[11] ; Seeds ^[13,17,18]
	Properties	Reported from
	Anticancer activity	<i>Oroxylum indicum</i> ^[19] , <i>Scutellaria baicalensis</i> ^[20,21,22,23,24]
	Anti-oxidant	<i>Oroxylum indicum</i> ^[25] , <i>Scutellaria baicalensis</i> ^[23,25,26,27,28,29]
	Cytotoxic activity	<i>Scutellaria baicalensis</i> ^[30]
	Antimutagenic activity	<i>Scutellaria baicalensis</i> ^[31]
	Anti HIV activity	<i>Scutellaria baicalensis</i> ^[32,33,34,35]
	Antiulcer activity	<i>Oroxylum indicum</i> ^[6]
	Apoptotic effect	<i>Scutellaria baicalensis</i> ^[36]
	Hepatoprotective activity	<i>Scutellaria baicalensis</i> ^[37,38]
	Cardioprotective properties	<i>Scutellaria baicalensis</i> ^[39,40]
	Protective effect on amnesia	<i>Scutellaria baicalensis</i> ^[41]
	Neuroprotective effects	<i>Scutellaria baicalensis</i> ^[42]
	Antiradical properties	<i>Scutellaria baicalensis</i> ^[43]
Anti-inflammatory effect	<i>Scutellaria baicalensis</i> ^[44,45,46]	
<i>In vitro</i> antigenotoxic effect	<i>Scutellaria baicalensis</i> ^[47]	
2	Name of the compound	Oroxylin-A (5,7-Dihydroxy-6-methoxyflavone) (Fig. 1)
	Derivatives present if any	Not reported
	Source	Stem, Roots, Stem bark and Root bark ^{12,15,16,48}
	Properties	Reported from
	Antibacterial	<i>Oroxylum indicum</i> ^[49]
	Antiviral	<i>Scutellaria baicalensis</i> ^[50]
	Apoptotic effect	<i>Scutellaria baicalensis</i> ^[36]
	Anti-inflammatory activities	<i>Scutellaria baicalensis</i> ^[51,52]
	Anti tumour activity	<i>Oroxylum indicum</i> ^[53]
	Anti-oxidant activity	<i>Vitex peduncularis</i> ^[54]
	Cytotoxic activities	<i>Scutellaria baicalensis</i> ^[30]
3	Name of the compound	Chrysin (5,7-dihydroxyflavone) (Fig. 1)
	Derivatives present if any	Not reported
	Source	Root and root bark ^[16,48] , Seeds ^[13] , Stem and Stem Bark ^[14,15,16]
	Properties	Reported from
	Antibacterial	<i>Oroxylum indicum</i> ^[55]
	Anticancer activity	<i>Scutellaria baicalensis</i> ^[56,57] , <i>Bauhinia purpurea</i> ^[58] , <i>Sonoran propolis</i> ^[59] , <i>Teloxys graveolens</i> ^[60]
	Antioxidant	<i>Oroxylum indicum</i> ^[61] , <i>Vitex peduncularis</i> ^[54]
	Antihemolytic effects	<i>Oroxylum indicum</i> ^[61]
	Anti-estrogenic effects	<i>Sonoran propolis</i> ^[62]
	Anti-microbial activity	<i>Turkish propolis</i> ^[63] , <i>Iranian propolis</i> ^[64] , <i>Oroxylum indicum</i> ^[65]
	Anti-inflammatory activity	<i>Oroxylum indicum</i> ^[65]
	Antiprotozoal activity	<i>Teloxys graveolens</i> ^[66]
Anti-viral activity	<i>Cyclanthera pedata</i> ^[67]	



Baicalein



Oroxylin-A



chrysin

Fig 1: Chemical structures of compounds**5. Reference:**

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